



# OAR Perspective: PM Supersites - Supporting Air Program Implementation and Developing a Future Agenda

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research  
and  
development

## Question

How can an advanced measurement program support important policy issues and provide direction for future air quality management practices?

## Goals

➤ To provide key stakeholders – state, local, tribal, and Federal agencies, regional planning organizations, the private sector, and the general scientific community – with:

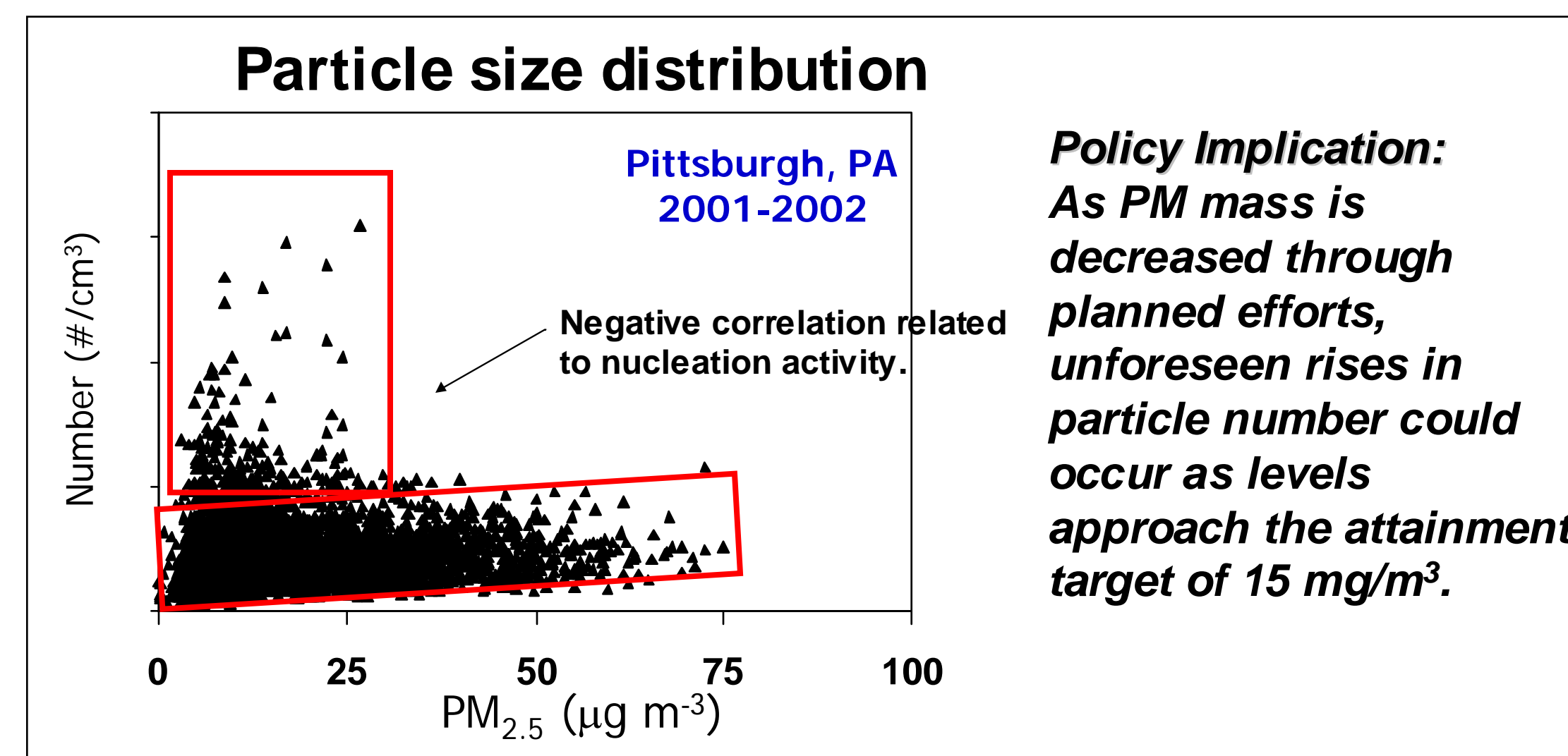
- (1) Sampling and analysis methods to measure the chemical and physical characteristics of PM and important precursor species,
- (2) Enhanced temporal and compositional characterization that complements routine ambient air monitoring networks, and
- (3) Insights into policy relevant phenomena that
  - corroborate current policies,
  - cause rethinking and modification, and
  - provide direction for future policy formulation.

## Approach

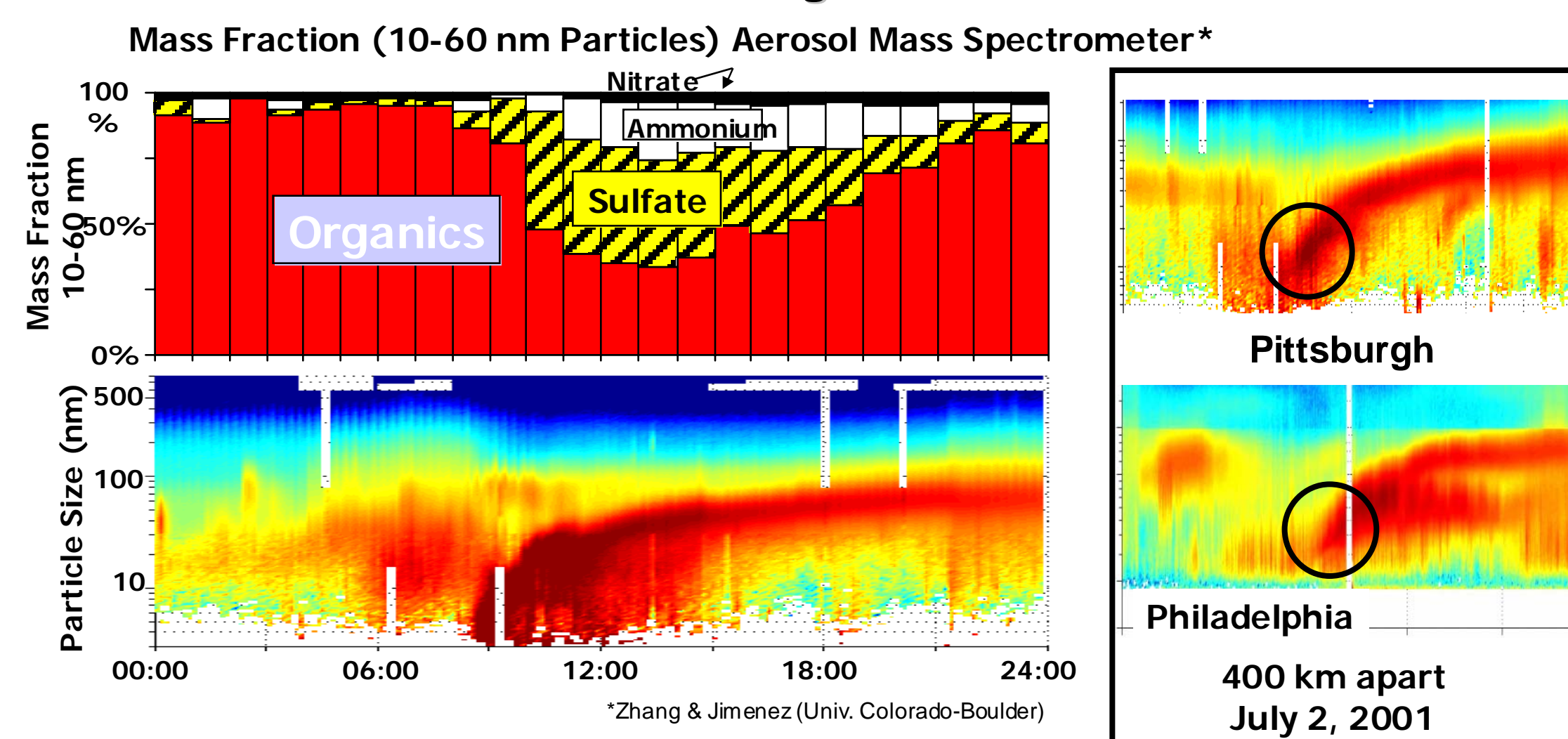
Develop, Evaluate, and Apply Advanced PM Instrumentation Across Diverse Cities



### Pittsburgh Supersites Project



### PM Nucleation / Formation in Regional and Urban Environments

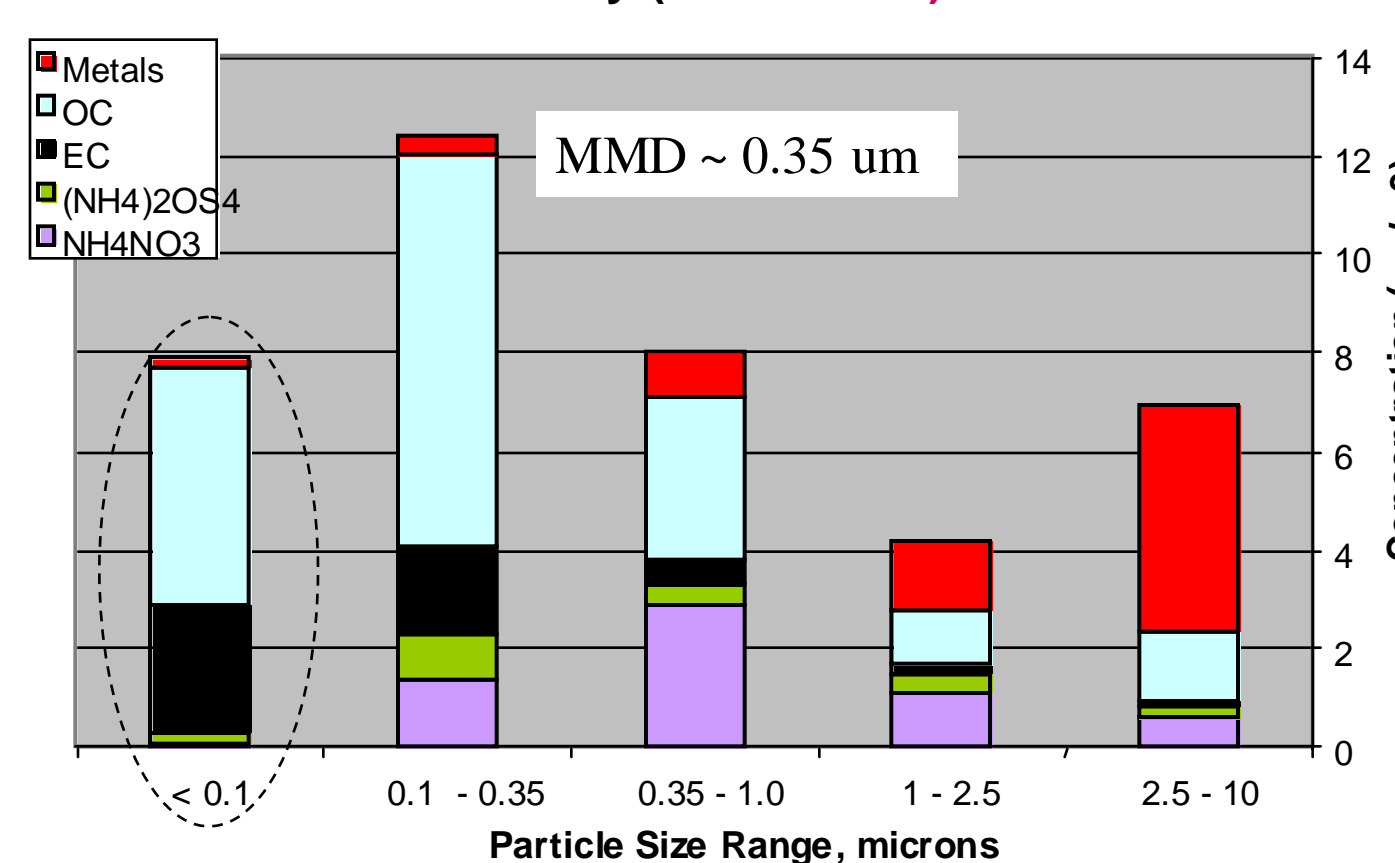


New insights regarding regional scale particle nucleation and formation are uncovered through the use of continuous particle size instrumentation in combination with aerosol mass spectrometry (top left). These findings include the explosion of particle number increase associated with sulfur, ammonia, water, and sunlight in otherwise “clean” atmospheres. The events appear to span several hundred kilometers (top right) and provide some explanation for the observations suggesting the potential for increasing particle numbers as an unforeseen outcome of reducing particle mass through SO<sub>2</sub> reductions in the Eastern U.S. Modeled reductions in ammonia seems to be most effective in reducing the frequency of occurrence.

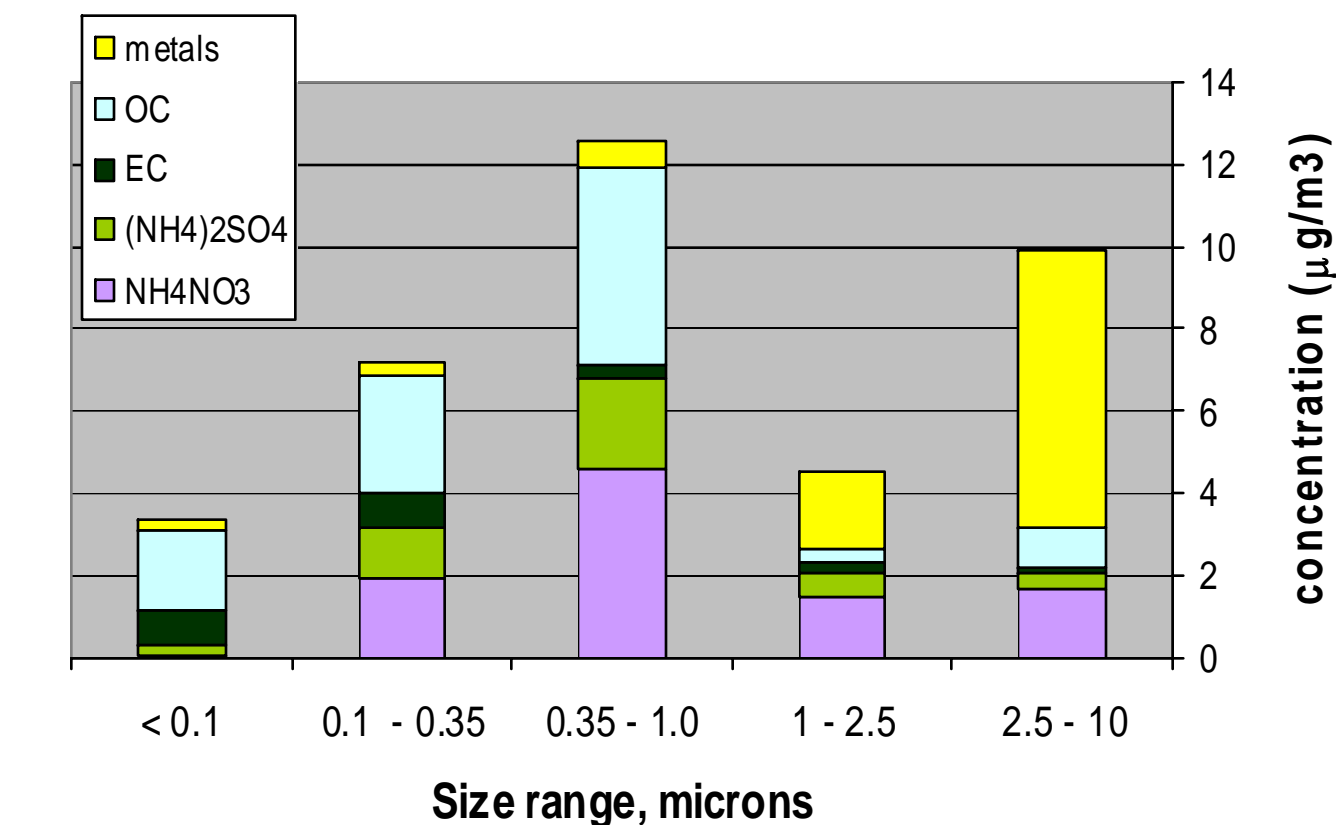
## Selected Results

### Los Angeles Supersites Project

24-h Average PM<sub>10</sub> Mass and Chemical Composition in Downey (Source Site)



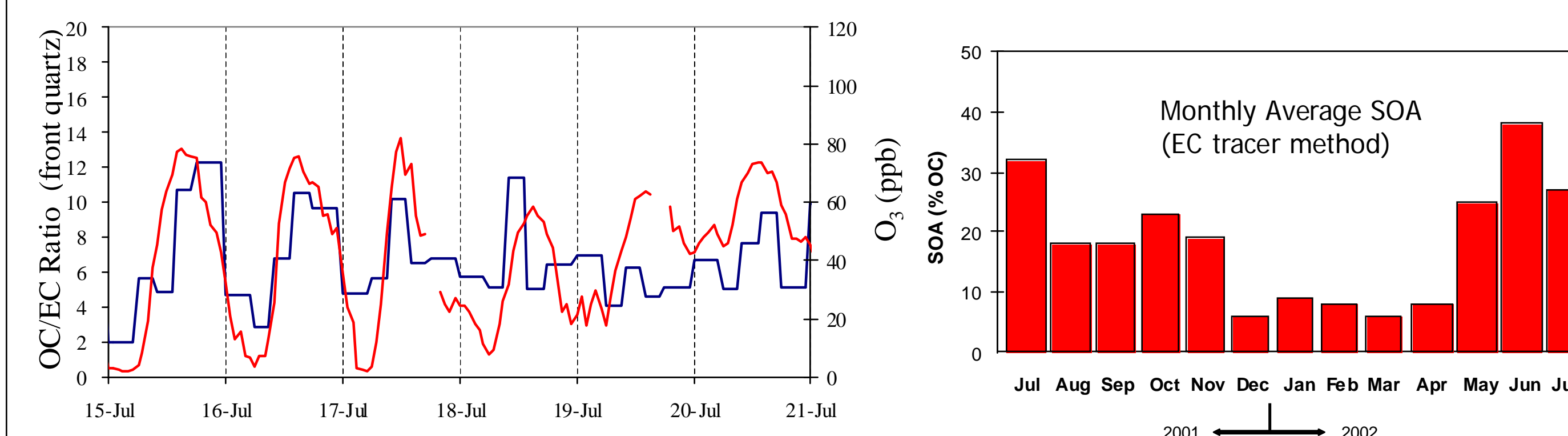
24-h Average PM<sub>10</sub> Mass and Chemical Composition in Rubidoux (Receptor Site)



In contrast, findings from Los Angeles suggest particle nucleation and number generation is dominated by release of mobile source-derived hot carbonaceous gases, creating a near field of carbon dominated by ultrafine particles (left) with gradual source to receptor transformation to increased particle diameter growth and inorganic content (right).

### Pittsburgh Supersites Project

#### Characterizing Secondary Organic Aerosols



Formation of organic carbon coincides with high ozone levels (left) indicating a strong role in the conversion of volatile organic compounds (including biogenically derived) as a significant contributor (right) to aerosol carbon mass.

➤ As national rules, such as CAIR, impart reductions in the inorganic component of PM, future emphasis on addressing the residual carbon burden will be complicated by the prevalence of source categories that may not be subject to future reductions.

## Impacts and Outcomes

- EPA's PM Supersites Program is providing an unprecedented wealth of information about **measurements methods, chemical composition, atmospheric processes, and source-receptor relationships**, simultaneously across the nation at cities with diverse source mixes, chemistry, and meteorological conditions.
- The Supersites Program **PIs are well engaged with key stakeholders**, working directly with state agencies in many cases and with EPA, DOE, industry, and others, providing results from the program in support of upcoming SIP development.
- Manufacturers' have applied results from measurement method evaluations to **improve commercial methods** or introduce new methods into the commercial venue.
- Policy relevant findings are being communicated simultaneously with key findings through the publication of **4 special journal issues** (JGR-2, AE, & AS&T) in world-renown atmospheric sciences journals and these can be easily assimilated into approaches for understanding PM accumulation and processes.
- A major **international specialty conference** was held in February 2005 to support dissemination of results to key stakeholders interested in reducing PM levels on urban and regional scales; over 340 papers were presented by the nearly 400 attendees.

## Future Directions:

"**Synthesis of Key and Policy Relevant Findings from EPA's PM Supersites Program and Related Studies**" will disseminate the key findings in a policy relevant framework by synthesizing results according to a series of **17 key science/policy relevant questions** developed by EPA in conjunction with state and other Federal agencies and regional planning organizations. Each question will be addressed technically, followed by the synthesis of the key atmospheric sciences findings and higher level integration to policy relevant and health relevant findings.

Air Quality